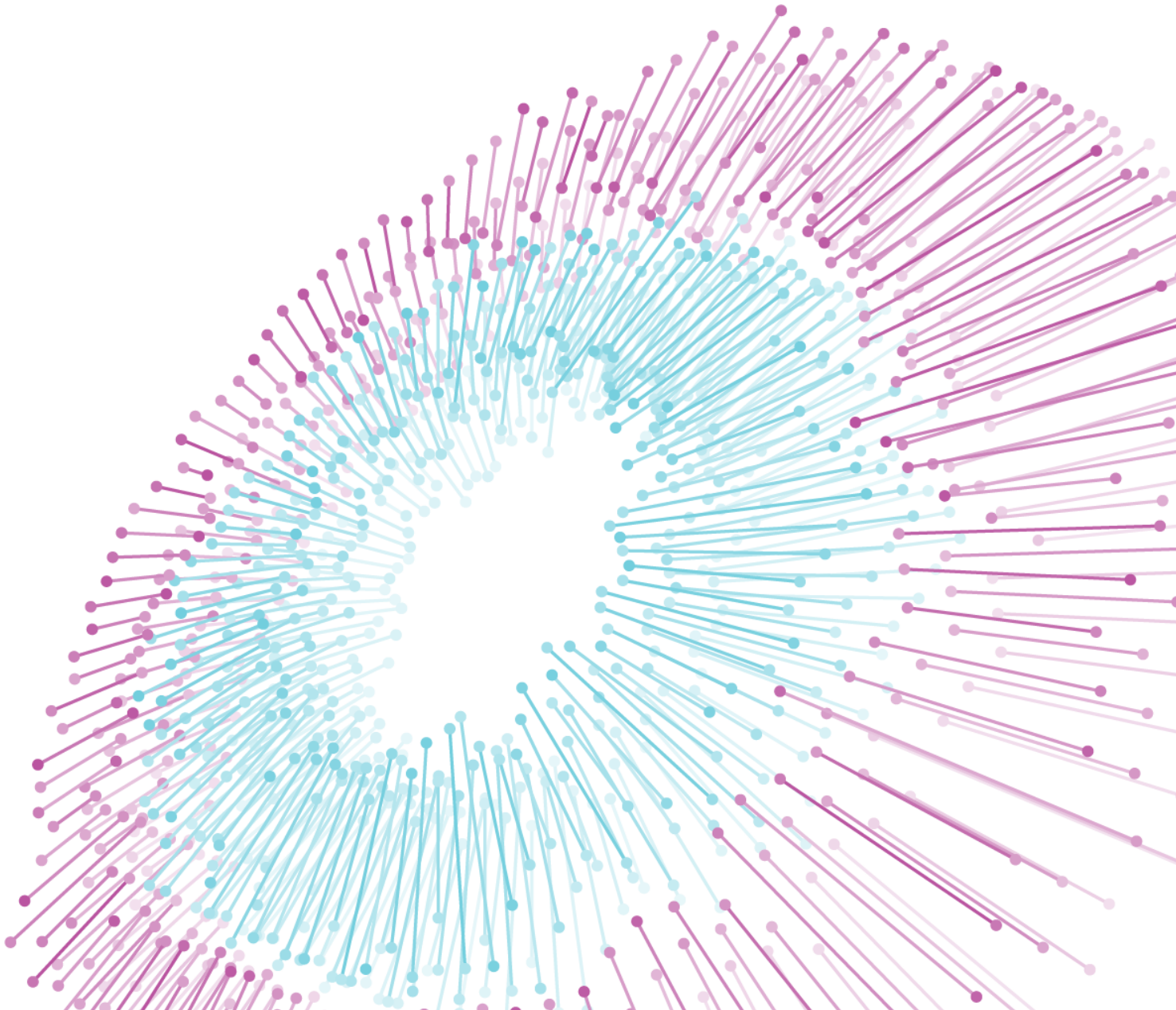




# Data Visualization Lab for Better Decision-Making:

A Framework of Data Visualization for Official Statistics in the State of Qatar

May 2023



### **Disclaimer**

This document was prepared by Dr. Ahmad Hussein, an expert in official statistics (ahussein@psa.gov.qa) at the Planning and Statistics Authority of the State of Qatar, with the valuable assistance of Ms. Sana Elashie, a research assistant. This document has been published without formal editing, and the opinions expressed within do not necessarily reflect those of the Planning and Statistics Authority. The author would like to express his gratitude to Ms. Maryam Rabiee, Head of SDGs Today Initiative for her valuable and constructive comments on the document. It is with highest appreciation that the author would like to acknowledge that without the support and backing of H.E. Dr. Saleh Al-Nabit, the president of the Planning and Statistical Authority and the assistant president H.E. Mr. Mohammed Abdulaziz Alnaimi, the workshop and the following valuable document could not have been achieved.



### **Data Visualization Lab:**

#### **Framework of Data Visualization for Official Statistics in the State of Qatar**

**April 2023**

### **Background:**

Investing time in learning data visualization techniques is worthwhile, as data visualization is becoming one of the most sought fields in data science overall. Moreover, excellent data visualization skills are high in demand across data and statistics domains. Data is beautiful and invaluable when presented the right way. We believe the visualization of data is a visual language, various stakeholders should learn and use this language, especially decision-makers. Visualizing the data is about telling the story behind numbers using graphics that provide a clear understanding of complex relationships within the data.

Visualization appears to bring advantages by increasing the amount of information delivered and decreasing the cognitive and intellectual burden to interpret information for decision-making. However, understanding data visualization interventions specific to national development leaders' decision-making is lacking, and there is little guidance for understanding a participant's characteristics and tasks. In line with the importance of data visualization. The planning and statistics organized workshop on "Data Visualization for Better Decision-Making" that was held during the period of 5-6 June 2023 remotely. To access and view the workshop materials [click here](#).

The evidence from this review suggests positive effects of data visualization can be identified, depending on the control of confounding factors on attitude, perception, and decision-making. Data visualization tools and technologies are a vital part of analyzing mass amounts of information to enable data-driven decision-making.





## Data Ecosystem & Lifecycle

The data ecosystem encompasses everything that handles, organizes, and processes data. This data life cycle describes the path data takes from when it's first generated to when it's interpreted into actionable insights. This life cycle can be split into eight steps: generation, collection, processing, storage, management, analysis, visualization, and interpretation<sup>1</sup>.

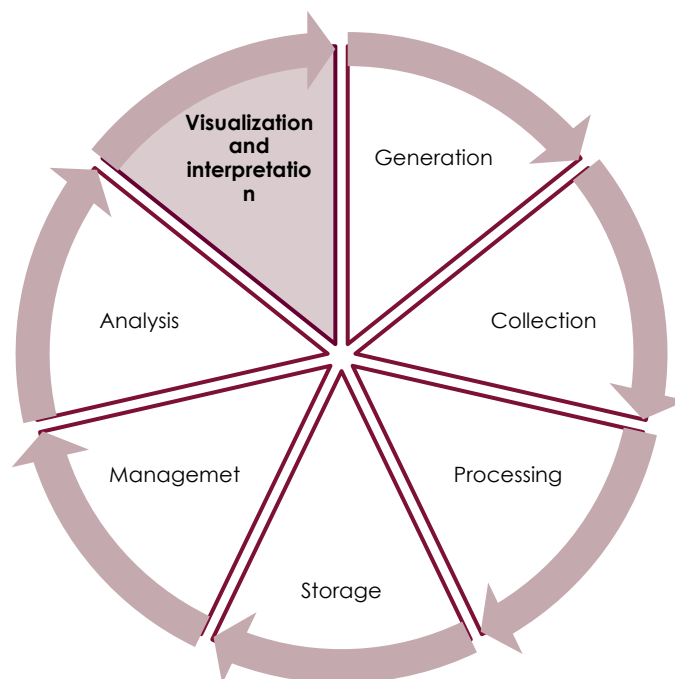
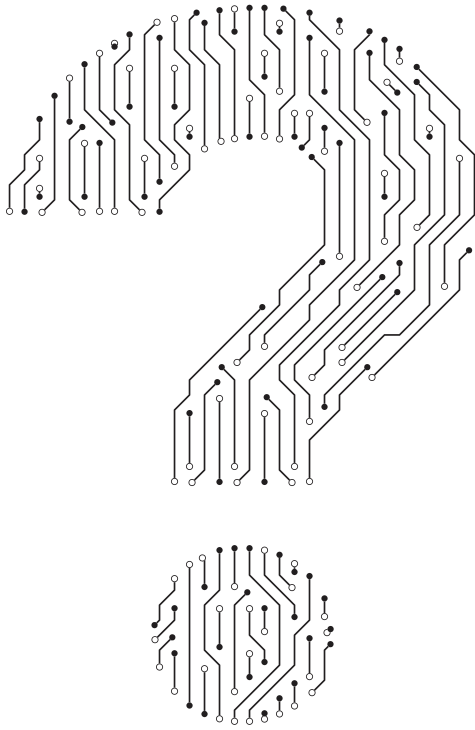


Figure 1 Data Ecosystem & Lifecycle

<sup>1</sup> Harvard Business School (2022), A Beginner's Guide to Data & Analytics





## What is Data Visualization?

Data visualization is a graphical representation of information and data. Through the creation of graphs, charts, plots, and other images, data visualization tools graphically illustrate data sets to see and understand any hidden patterns, spot trends, outliers, and correlations. Human eyes are naturally drawn to colors and patterns. Thus, decisions based on data visualization can make more sense because of the visual format, rather than just staring aimlessly at a massive spreadsheet full of data. By transforming large amounts of numbers and text into clear visuals data become much more meaningful for data users to guide their decisions.<sup>2</sup>

Visualization is an increasingly key tool to make sense of the trillions of rows of data generated every day. Data visualization helps to tell stories by curating data into a form easier to understand, highlighting the trends and outliers. A good visualization tells a story, removing the noise from data and highlighting useful information.

This project combines the science of data visualization with the art of graphic design to help us to communicate complex information more accurately and effectively. By transforming data sets into visual graphics—such as charts, bar graphs, scatterplots, and heatmaps—we will learn to present complex data in ways our audience can better understand. Through hands-on exercises, the Audience will explore the many types of data in use today, learn how people perceive different graphical displays, and create visual presentations that make a stronger impact on our target users<sup>3</sup>.

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<sup>2</sup> Hurree. (n.d.). The Essential Guide to Data Integration. [info.hurree.co](http://info.hurree.co)

<sup>3</sup> [professional.dce.harvard.edu](http://professional.dce.harvard.edu)

## Why is data visualization important?

1. Provides insights into societal patterns and explore new ways of understanding information
2. It be seen as an abstraction of complex realities, it contextualizes the numbers representing social, economic, and environmental challenges
3. It has a greater impact in communicating gaps and the urgency to address various challenges
4. Numerical representation results support critical thinking
5. Building data trust by making data accessible and actionable
6. Visualizing projections can help shape a more comprehensive understanding of the future and the action we need to take
7. Tracks progress, spot trends, and begin using our insights to drive informed strategic decisions of the 3<sup>rd</sup> National Development Strategy
8. Accelerates the implementation of the Sustainable development goals 2030
9. Transfer insights and results to non-data experts, by producing accessible and actionable data
10. Demonstrate the story behind data meaningfully by highlighting relevant information
11. Help data users to comprehend vast amounts of data at a glance and in a better way.



## Stages of data visualization:

To ensure both the exploratory and persuasive powers of visualizing data, a four-stage workflow is recommended. The four stages in the visualization workflow are:

- 1. Purpose**  
determine the purpose of the visualization.
- 2. Content**  
create or obtain the data that has the potential to aid the purpose articulated in stage 1
- 3. Structure**  
map data to visual aesthetics and select geometrical shape that are most likely to reveal underlying patterns and insights.
- 4. Formatting**  
polish and format the best visual(s) from stage 3 so that they are more informative and/or persuasive for our intended audience; make the visuals look professionally done as required.



### Goals of the project:

1. Develop a comprehensive data visualization framework for the development of better data quality and delivering actionable reporting for faster decision-making in all aspects of official statistics to use data and present it in ways that will make an impact.
2. Involve a significant number of statisticians, data scientists, users, and producers of official statistics, from various line ministers, to analyze, visualize data, and present it in ways that will make an impact.
3. Provide guidelines and advice on how to build professional data visualization products relevant to the decision maker's interest.
4. Project involves the use of existing tools for the visualization of selected datasets.



### Objectives:

1. Communicate data findings and identify critical information driven by data visualization and develop an interactive data visualization product to make all the difference in preparing interactive publications.
2. Strengthen the impact of messaging for the audiences and presents the data analysis results in the most persuasive manner.
3. Promotes storytelling in the most compelling way and conveys the right message to the audience.
4. Aid decision analysis by data visualization insights and allow access to the right kind of information and visualization to represent information and keep it relevant.
5. Identify patterns, trends, and outliers in large data sets
6. To explore, monitor, and explain. While some visualizations can span more than one of these, most focus on a single goal.
7. To make sense of the data and use the information for the organization's benefit.
8. To make data widely accessible and useable
9. Democratize statistics and data in order to enable the Planning and Statistics Authority to be resilient and able to deal with current and future crises
10. Reinforce the culture of data and build trust
11. Shed light on the importance of data visualization for decision-making in various societal domains





### The relationship of the project with other data sources of official statistics:

The data visualization lab will use and integrate selected outcomes of the PSA central statistical data warehouse, PSA data lake, open data, cloud applications, big data repositories, Arab SDG Monitors, results of national surveys, administrative, data, and specialized UN Databases. In addition, to train line ministries to visualize their data



### Activities:

1. Conduct needs assessment to determine what needs to be accomplished
2. Conduct a two-day introductory training workshop on the theory of data visualization and its framework for users and producers of official statistics from various line ministries.
3. Develop a comprehensive toolkit on data visualization and its components
4. Provide guidelines to the partners to prepare data visualization products using the available tools,
5. Conduct the second training workshop on data visualization for official statistics to discuss with the partners the challenges they faced in preparing the visualization products and the way forward
6. Develop an interactive platform to upload the data products of the partners on health, education, gender, disability, etc.



### Expected Outcome:

1. Understand the visualization pipeline with its relationship to other data pipelines
2. Understand the advantages of data visualization for design making
3. Know the definition(s) of the visualization and interpretations of the notion
4. Understand the types of transformation the data has undergone to improve the effectiveness of the visualization
5. Know various types of visualization
6. Understand the foundations of the visualization processes, from basic building blocks to taxonomies and frameworks
7. Know what spatial attributes of data will map to the spatial attributes
8. Understand the visualization design process
9. Enable the partners to acquire the skill to produce various types of visualization
10. Know some commercial data visualization software packages with their functionalities
11. An interactive platform to store the data visualization products from various PSA Departments and line Ministries



## The Framework of The Data Visualization Project

There are many ways to visualize data, including charts and graphs, scatterplots and diagrams, network graphs, matrices and heatmaps, and geographic maps. Ideally, visualizations aim to be interactive, allowing data users to picture beyond the surface-level data and into the underlying information to answer questions or decision-making. Data visualization can range from the following:

1. Graphical presentation
2. Infographics
3. Dashboard
4. Interactive publications
5. Storytelling
6. Social media
7. Podcasts
8. Press release
9. Data journalism
10. Geographical presentation



### 1. Graphical presentation

Choosing the right chart for the job depends on the kinds of variables that we are looking at and what we want to get out of them. The type of data visualization is selected based on the representation aim, and the roles of data visualization<sup>4</sup>

1. Showing change over time (Bar charts, Line charts, box plots, and other specialist chart types)
2. Showing a part-to-whole composition (pie chart, stacked bar chart, stacked area chart, Marimekko plot, and tree map)
3. Looking at how data is distributed (Bar charts, histogram, violin plot, box plot)
4. Comparing values between groups (bar chart, line chart, grouped bar chart, Violin plots, funnel chart, Bullet charts)
5. Observing relationships between variables (scatter plot, connected scatter plot, bubble chart, dual-axis plot, heatmap)
6. Looking at geographical data (choropleth, Cartograms)

A picture is indeed worth a thousand words, or a thousand data points. Graphs (or charts) can be extremely effective in expressing key results or illustrating a presentation.



### 2. Infographics

The most common definition of an Infographic describes it simply as a visual representation of information and data. By combining elements of text image, chart, diagram, and, more recently, video, an infographic is an effective tool to present data and explain complex issues in a way that can quickly lead to insight and better understanding.<sup>5</sup>

<sup>4</sup> Yi. M., Restori. M. (n.d.). How to Choose the Right Data Visualization. <https://www.smartsheet.com/content/project-outline-templates>

<sup>5</sup> Infogram. (n.d.). What is an Infographic? <https://infogram.com/page/infographic>

According to Jaime Serra, one of the most influential designers in the world for the past two decades -, an infographic is “a form of communication that uses visual language and text. Both languages are complementary, part of a whole, and therefore can’t be understood when separated. The term “infographics” has expanded to many industries in the past decade, becoming a powerful communication tool for businesses, governments, and educational institutions. There’s a whole new audience of professionals interested in presenting data in a more compelling, insightful, and engaging way.

Infographics allow us to walk away with the information we can use to make better decisions without having to deep dive into the data. They help drill data down so audiences can get a view of the research problem – the big picture that we’re all trying to see – as well as answer deeper questions about the results of that research<sup>6</sup>.

### Example:

[Infographic: Human Rights of Women | UN Women – Headquarters](#)  
[Undernourished and Overlooked - UNICEF DATA](#)  
[Become a factivist! \(globalgoals.org\)](#)



### 3. Dashboard

A dashboard is a data visualization tool that tracks, analyzes, and displays KPIs, metrics, and critical data points. Dashboards empower both technical and non-technical users to understand and leverage business intelligence to make more informed decisions. Users actively participate in the analytics process by compiling data and visualizing trends or occurrences and uncovering an objective view of performance metrics that can be immediately understood. Besides, dashboards feature visualized data via charts, tables, and gauges. Viewers use these visualizations to monitor the health of the organization against established goals and industry benchmarks.<sup>7</sup>



### 4. Interactive publications

Unlike PDFs, interactive publications are fully functioning web pages with the potential to be fully indexed by search engines. This style of keyword-driven content has the power to move PSA up in the search rankings, driving a higher level of engagement from those interested in statistics. Furthermore, Interactive publications allow us to get a quick and interactive overview of the situation of the state of Qatar and compare it to some other Arab and foreign countries. The different visualization tools offer us a playful way to dig into selected statistics focusing on people, society, economy, business, environment & natural resources.<sup>8</sup>

#### Example for illustration:

<https://ec.europa.eu/eurostat/web/products-interactive-publications>

<sup>6</sup> <https://insightrix.com/data-visualization-vs-data-representation/>

<sup>7</sup> Adjust. (n.d). What is a dashboard. <https://www.adjust.com/glossary/dashboard/>

<sup>8</sup> Sisense. (n.d.). Interactive Data Visualization. [www.sisense.com](http://www.sisense.com)





## 5. Storytelling

Data storytelling turns data into actionable insights, it is defined as the ability to effectively communicate insights from data using three important elements: **data, visuals, and narrative** to create engaging and easily understood actionable outcomes. It relies on knowledge of context, audience, purpose, and the ability to turn the results of data analysis into meaningful information.<sup>9</sup> For instance, a report from the Harvard Business Review demonstrate human beings are naturally wired to respond better to storytelling than most other forms of content sharing. This is because a narrative has an impact on our brain which promotes the production of “oxytocin,” a hormone associated with trust.<sup>10,11</sup>

Visuals can help educate the audience on our theory. When we connect the visual assets (charts, graphs, etc.) to our narrative, we engage the audience with otherwise hidden insights that provide the fundamental data to support our theory. Instead of presenting a single data insight to support our theory, it helps to show multiple pieces of data, both granular and high level, so that the audience can truly appreciate our viewpoint. We can say Statistical storytelling is about:

- Catching people's attention with a headline or image.
- Provide an easily understood, interesting, entertaining example of a story behind the numbers, and.
- Encouraging others to consider how the statistics might serve the stories they have to tell<sup>12</sup>

Storytelling is not separate but a part of the data-driven decision-making phase. Social change leaders should make deliberate efforts to make data mean more through storytelling. Data should always be complemented by a story; we should not just show data but rather make data a pivotal point in an overarching story. Stories can be used to communicate results. Data without a story will sometimes not tell the whole story, there are always missing puzzles, and stories help bring data to life. Social change leaders should always think about how they can leverage that power when communicating using data<sup>13</sup>. As we embark on this storytelling journey, stories should always end with ‘A Call to Action’

In addition to avoiding linguistic conventions and literary form, storytelling excels at exploiting storiness, with space serving as the primary communication medium, spatial storytelling involves immersing the user in a mediated environment whose discovery through exploration progresses a non-linear narrative ‘Reader’s Perspective’

All in all, the process of creating story might invoke pre-existing narrative connections, create a setting for the portrayal of narrative events, include narrative information into the scene, or act as a source for emergent narratives.

<sup>9</sup> Eliiza. (n.d.). Data Storytelling: what is it, best practice and a framework. [eliiza.com.au](http://eliiza.com.au)

<sup>10</sup> Zak, J. (2014). Why Your Brain Loves Good Storytelling. [hbr.org](http://hbr.org)

<sup>11</sup> Cote, C. (2021). Data Storytelling: How to Effectively Tell a Story with Data. [online.hbs.edu](http://online.hbs.edu)

<sup>12</sup> UN ECE (2005) Making Data Meaningful: a guide to writing stories about numbers.

<sup>13</sup> <https://atlascorps.org/data-the-power-of-storytelling-in-global-development%E2%82%AC%A0%E2%82%AC/>



### SDG & COVID-19

It is worth mentioning that the SDG & COVID-19 Data Visualization Toolkit, developed as part of the UNSD-FCDO Project on SDG Monitoring, aims to support countries in data storytelling through infographics, reports, online platforms, presentations, promotion materials, and social media.<sup>14</sup>

The toolkit contains icons and templates for the development and delivery of engaging dissemination materials relating to both the SDGs and the COVID-19 pandemic. These icons and templates are open sources, meaning they are freely usable by all ESCWA in collaboration with PSA developed an interesting Arab SDG to monitor and track the progress in implementing the various goals of the SDGs<sup>15</sup>



### ArcGIS StoryMaps

Excellent tool for contextualizing data, for conveying to different audiences and interest groups why the data matters and how they can interpret and use it, and for telling important narratives about an organization's work. SDGstoday's StoryMap collections function to highlight the important work individual leaders and partner organizations are doing to advance awareness and solutions towards Agenda 2030.

**Further illustration:** <https://sdgstoday.org/storytelling>



## 6. Geographical presentation on maps

Map visualization is used to analyze and display geographically related data and present it in the form of maps. This kind of data expression is clearer and more intuitive. We can visually see the distribution or proportion of data in each region. It is convenient for everyone to mine deeper information and make better decisions. The visual maps allow decision-makers to see the interdependencies between images.

There are many types of map visualization, such as administrative maps, heat maps, statistical maps (bubble maps, choropleth maps, connection maps, dot map flow maps), and trajectory maps. Also, maps can be divided into 2D maps, 3D maps or static maps, dynamic maps, and interactive maps. Maps are often used in combination with points, lines, bubbles, and more.<sup>16,17</sup> Geospatial visualization and analysis ensure that we meet the promise of the SDGs to “leave no one behind.” The goal is to represent “everyone everywhere” on a map in order to support all communities.

**SDGs Geospatial Roadmap** has been developed collaboratively as a strategic information and communications mechanism that builds the bridge and understanding between the statistical and geospatial actors working within the Global Indicator Framework. The vision of the SDG Geospatial Roadmap is to see geospatial and location-based information being recognized and accepted as official data for the SDGs and their global

<sup>14</sup> <https://unstats.un.org/capacity-development/UNSD-FCDO/sdgs-data-visualization-toolkit/>

<sup>15</sup> <https://arabsdgmonitor.unescwa.org/country-profile-new/tab2.aspx>

<sup>16</sup> Chou, L. (2019). Top 10 Map Types in Data Visualization. [towardsdatascience.com](https://towardsdatascience.com)

<sup>17</sup> Safegraph. (n.d.). 12 Methods for Visualizing Geospatial Data on a Map. [safegraph.com](https://safegraph.com)

indicators. In fact, the SDGs are highly dependent on the understanding of geographic location, necessitating the inclusion and use of geospatial information, Earth observations, and other forms of location-based data.<sup>18</sup>

### **Guide on Geospatial Data Integration in Official Statistics**

PARIS21 publication provides a practical guide, based on five principles for national statistics offices to form stronger partnerships with national geospatial integration agencies. Since national geospatial integration organizations can offer thorough, current, and pertinent information about people, organizations, structures, infrastructures, agriculture, natural resources, and anthropogenic effects on the biosphere. Integrating geospatial data into established national statistical systems has definite advantages. Together, they paint a very accurate picture of the social, economic, and environmental problems that support sustainable development and enable better policy decisions.

According to the PARIS21 publication “Guide on Geospatial Data Integration in Official Statistics” they illustrated five main principles for national statistics offices to form stronger partnerships with national geospatial integration agencies:

**Principle 1:** Accessible and usable

**Principle 2:** Statistical and geospatial interoperability

**Principle 3:** Common geographies for the dissemination of statistics

**Principle 4:** Geocoded unit record data in a data management environment

**Principle 5:** Use of fundamental geospatial infrastructure and geocoding

For illustration, over the last 10 years, FAO assisted around 70 countries in producing national land cover databases and crop forecasts by using Earth Observation data. FAO’s Agricultural Development Economics Division developed the Sent2Agri toolbox with the University of Louvain and the European Space Agency, a set of methods and tools to produce Earth Observation products for agriculture monitoring. Thus, the integration between statistical and geospatial data is fundamental to improve the monitoring of global development outcomes. Furthermore, FAO’s Statistics Division and the FAO Corporate Statistical Database (FAOSTAT) joined efforts to deliver innovative products that assist countries in filling potential gaps in data collection. Finally, the FAO’S Data Lab for Statistical Innovation is developing a new tool in collaboration with the FAO’s Office of the Chief Statistician that links the use of satellite imagery to agriculture mapping and crop assessment, and which will be capable of producing estimates on agricultural production.<sup>19</sup>



## **7. Social Media**

Data visualization is a powerful tool that can be used in social media to communicate complex information to our audience in a clear and engaging way. Here are some tips on how to use data visualization effectively in social media:

<sup>18</sup> The SDGs Geospatial Roadmap (2022), [https://ggim.un.org/meetings/GGIM-committee/11th-Session/documents/The\\_Geospatial\\_SDGs\\_Roadmap\\_WGGI\\_IAEG\\_SDGs\\_20210804.pdf](https://ggim.un.org/meetings/GGIM-committee/11th-Session/documents/The_Geospatial_SDGs_Roadmap_WGGI_IAEG_SDGs_20210804.pdf)

<sup>19</sup> Food and Agriculture Organization <https://www.fao.org/datalab/website/web/home>



1. Choosing the right type of visualization
2. Keeping it simple and focused on the key insights
3. Using color to highlight important data points or to group related data
4. Making it interactive

**Note:** Consider using tools like interactive dashboards or data exploration tools to make visualization more engaging.

5. Providing the context

**Note:** use annotations, captions, or other explanatory text to provide context and help audience interpret the data.

Incorporating data visualization into social media content plan is a proven way to grow engagement, particularly infographics work well in the social media:

1. Visuals help people easily understand the message
2. Infographics help us to retain relationships with followers
3. Infographics prompt the audience to read our post
4. People are more likely to remember the infographics

Overall, data visualization can be a powerful tool for social media marketers, but it's important to use it effectively.



## 8. Podcasts

A podcast is a type of digital media, usually audio, that is available in a series of episodes or parts and is streamed or downloaded by the end user over the Internet. Podcasts can be made available via a release schedule or uploaded to the Web randomly.

Despite the ease and speed of current mobile data, it is wise to keep a keen eye on how much data we are using on a day-to-day basis, as streaming on the go can quickly rack up a fortune in phone bill excess. The podcast format needs to align with the goals of the project.

The main purpose of most podcasts is to provide entertainment and information to their listeners and most importantly keep them engaged. A podcast can vary in the length of time it runs per episode, typically a podcast will be between 20-40 minutes, but they can run up to 2-3 hours if the podcaster has enough interesting content to fill this time. They can either be daily, weekly, or monthly episodes or have no time pattern at all.<sup>20</sup> In a nutshell, a podcast is a kind of online audio broadcast. People might listen to a podcast once-off when winding down at home after a hectic day or simply relaxing. Or, as the following podcast statistics will show, it is also popularly consumed while multitasking such as commuting to or from work, doing chores, working out, and so on

**Storytelling in podcasting** is an essential skill that allows us to capture attention and engage with listeners. It can help us to transform a basic message we want to tell into an immersive episode. To master podcast storytelling, we need to control the episode structure, pacing, emotions, music, and scenario

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<sup>20</sup> <https://profiletree.com/what-is-a-podcast/>

**Example for illustration:**

[Podcasts | Al Jazeera](#)

[UN ESCWA's podcast - Hosted by UN ESCWA \(acast.com\)](#)

Office for National Statistics (ONS), Podcast Statistically Squeaking: [podcast | National Statistical \(ons.gov.uk\)](#)



## 9. Press release <sup>21</sup>

Usually, National Statistical Offices (NSOs) develop a policy concerning the electronic pre-release of statistical data to the media under embargo. This system provides an opportunity for journalists to digest the information at dispersed locations and build their storylines before the data are officially released to the public. However, a pre-release also places the integrity of the NSO at risk if the embargo is not honored and creates a potential risk of inequitable access to information.

An alternative to the embargo system is the media lock-up. Under this system, members of the media are physically "confined" to a media room for a certain period to give them an advanced look at the news releases and let them prepare their stories for transmission precisely at release time. While the lock-up reduces the risk of unauthorized pre-release, accessibility is limited to journalists working near the NSO.

Not all statistical organizations pre-release their data. Some organizations, either for logistical, security or other reasons, release their data to everyone at the same time. A media advisory notice sent to the media in advance of the release could put reporters on alert.

The news release is the fundamental tool for presenting information to the media. It provides interesting and newsworthy information in a concise, ready-to-use format. Its primary goal is to convince a reporter that we got a story worth pursuing. Some media outlets—particularly smaller publications and websites—may simply republish news releases. Most will devote time and energy to pursuing a story about the information or event.

The statistical organization should ensure that the subject matter of the news release is timely and newsworthy, that the information provided is factual and accurate, and that the release is written in clear and easy-to-understand language.

But even with the best news release, there is no guarantee that it will be picked up by the media. News organizations may have other themes on their agenda, or they may decide that the news release is not newsworthy.

Statistical organizations may have different names for a news release: "News Release", "Press Release" or "First Release" are common terms. Shorter releases on metadata, which provide background material, or those announcing an upcoming event may be called a "Media Advisory," "News Bulletin," "Tip Sheet," or "Note to Editors." Finally, to convey more in-depth information to the media, some organizations will issue a "Backgrounder" or "Fact Sheet", which is generally longer and more detailed than a normal news release.

Regardless of terminology, an individual need to be consistent in naming their release of new and interesting data; do not use multiple names for essentially the same news content. The media should immediately recognize

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<sup>21</sup> This part of the document was based on the UN ECE manual titled Making Data Meaningful. Part 3. A Guide to Communicating with the media. Chapter 5, and a Discussion on Press Release Writing with Gina Bericchia. <https://www.youtube.com/watch?v=zdZz5mBslZU>. The Ohio State University

the label on a package of potential interest to them. News releases are written for journalists who are usually working under time pressure. As a result, the release should be tailored to their needs. Some guidelines follow.

### Structure and contents of the press release

- short and simple!
- Should take the shape of an inverted pyramid, where the most important message is at the top, with additional points following in order of decreasing importance. It is “inverted” because conclusions are at the beginning rather than at the end, contrasting with generally accepted academic or scientific writing styles
- The headline or title of a release often determines its fate
- Starts with a lead paragraph, like a newspaper article, which captures the reader's attention and, at the same time, conveys the principal message of the data
- If a picture is said to be worth a thousand words, so is a well-constructed table, graph, or map. Tables are a good way of summarizing results, but graphs and maps can show trends or patterns in a way no text could.
- Use sub-headings, when possible, to break the text into manageable portions
- Mention the statistical organization as the official source of the data in the lead paragraph,
- OECD is a good source for statistical press releases <https://www.oecd.org/sdd/statisticsnewsreleases.htm>



## 10. Data journalism

Data journalism is a journalistic process based on analyzing and filtering large data sets for the purpose of creating or elevating a news story since data consists of structured facts and statistics that require journalists to filter, analyze and discover patterns to produce stories. The primary goal for DDJ is telling stories based on the data, the findings from the data can be transformed into any form of journalistic writing. Thus, visualizations can be used to create a clear understanding of a complex situation. Indeed, reporting numbers tends to have a low retention rate among members of the public due to the augmented abstraction of complex statistics. Data journalism tasks itself with the mission of unpacking the abstraction of statistical reporting to contextualize numbers by connecting them to the individuals or groups that produce them. Rather than just reciting the numbers behind figures, data journalism provides audiences with multi-layered, database-driven, informational experiences which are far more engaging and enjoy of a much higher retention rate (Borges-Rey., 2016).

Furthermore, elements of storytelling can be used to illustrate what the findings mean, from the perspective of someone who is affected by a development. This connection between data and story can be viewed as a "new arc" trying to span the gap between developments that are relevant but poorly understood, to a story that is verifiable, trustworthy, relevant, and easy to remember.

Data journalism also reaches out to experts who can explain the reasons behind an outlier or a trend in the numbers. By making numbers more accessible to the audience, data journalists have also been able to increase data literacy amongst the public, which normally become more active in the process of making sense of the data made available by both public and private organizations (Borges-Rey., 2017).

### Tools of data visualization

Data-driven evidence is delivered through BI technologies to aid decision-making. Data is now accessible to everyone with BI technologies that allow the creation of dashboards and reports to track progress, set goals, and use a variety of other BI tool features.

In any data-driven business, data visualization is necessary. It turns data into visuals, making it easier to understand, digest, and make important business decisions from data visualization creates actionable insights.

There are many data visualization tools available, and we've done research to determine the best for our project. These tools should be versatile, easy to use, able to handle datasets and allow us to visualize data in a variety of ways to suit our project needs.

### 1. Microsoft Excel

MS Excel has a lot of tools for making charts, graphs, and maps, among other visualizations. Additionally, Excel data can be transferred into tools for data visualization for additional analysis. Excel is viewed by some data visualization specialists as more of a data management tool than a data visualization tool, nevertheless. Excel data visualizations are visual representations of numerical data, an accessible and arranged format for data in a spreadsheet, such as a line graph, Gantt chart, or bar graph

- Easy To Store Data: Since there is no limit to the amount of information that can be saved in a spreadsheet, MS Excel is widely used to save data or to analyze data. Filtering information in Excel is easy and convenient.
- Easy To Recover Data
- Very secure
- Application of Mathematical Formulas: Doing calculations has become easier and less time-taking with the formulas option in MS Excel
- Data at One Place
- Neater and Clearer Visibility of Information

### 2. Microsoft Power BI

Microsoft created Power BI, an interactive data visualization tool with a strong business intelligence component. It's a component of Microsoft Power Platform. A group of tools, services, and connectors known as Power BI combine to transform disparate data sources into coherent, interactive insights with a strong visual component. Data can be entered by reading straight from a database, website, or structured files like CSV, XML, and JSON.

- Cloud-based
- Affordable
- Strong brand interaction with Ms. Tools
- Big active community
- Consistent and upgradeable

### 3. Microsoft PowerPoint

- PowerPoint is a potent tool for data visualization
- Can effectively convey the data in an interesting and engaging manner.
- PowerPoint allows the use of graphs, charts, and tables that can be exported from other sources such as Word and Excel.
- Enable the insertion of pre-created images such as infographics or pictograms
- Allowing the presenter to easily share their statistics with their audience and provide a visual focal point for them to focus on.

### 4. Tableau Software<sup>22</sup>

we can deal with practically any form of data in Tableau because to its user-friendly drag-and-drop interface, which makes it simple to learn.

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<sup>22</sup> Dan Jewett (2009). Tableau and the Enterprise Data Warehouse: The Visual Approach to Business Intelligence

- Outstanding visual library
  - User friendly
  - Great performance
  - Connectivity to data sets
  - Power computerization
  - Quick insights
5. **Google Data Studio (Looker Studio)**
- Easily access a wide variety of data
  - Turn our data into compelling stories of data visualization art
  - Quickly build interactive reports and dashboards
  - Collaborate in real time
  - Web-based reporting tool
6. **D3.js**
- is a JavaScript library for manipulating documents based on data. D3 helps us bring data to life using HTML, SVG, and CSS. D3's emphasis on web standards gives us the full capabilities of modern browsers without tying ourselves to a proprietary framework, combining powerful visualization components and a data-driven approach to DOM manipulation (<https://d3js.org/>).
7. **Apexcharts**
- ApexCharts is a modern charting library that enables programmers to design stunning and engaging visualizations for websites. It is a free open-source project with an MIT license that can be used for business purposes (<https://apexcharts.com/>).
- **Built for developers:** thorough API documentation and more than 100 ready-to-use samples, integrating visualizations with ApexCharts is as easy as it gets.
  - **Several Chart Types:** pick from a variety of charts, to clearly show the differences between the data, combine many graphics.
  - **Fully Responsive:** ApexCharts are flexible and approachable - making charts work on desktops, tablets as well as mobiles.
  - **Highly Customizable Charts**
8. **Highcharts**
- Highcharts library give access to all the resources we need to build secure and dependable data visualizations. All charting libraries may be used with any back-end database or server stack because they are built on JavaScript and TypeScript. It provides wrappers for the most widely used programming languages, including (Net, PHP, Python, R, Java, iOS, and Android, as well as frameworks like Angular, Vue, and React) (<https://www.highcharts.com/>)
9. **Esri**
- Esri is the global market leader in geographic information system (GIS) software, location intelligence, and mapping (<https://www.esri.com/en-us/about/about-esri/overview>)

### Communicating Using Data Visualization Products

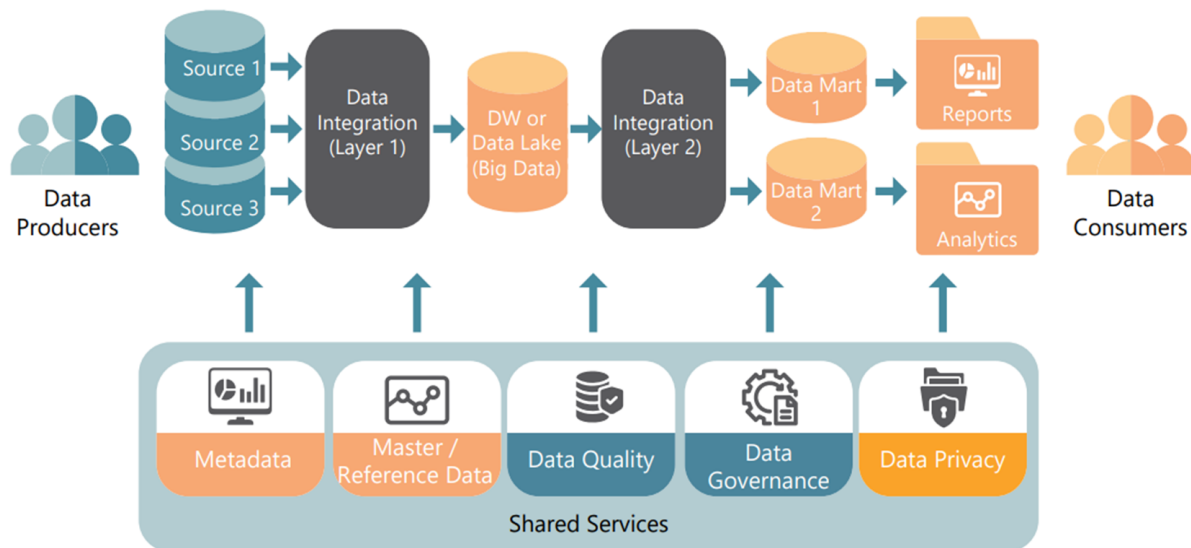
Data visualization is valuable to various users and decision makers only if they are easily found and accessible, and if they find them relevant and easy to understand and use. Our project will take extra care when communicating with users to balance the need to remain impartial with the obligation to produce relevant data visualization to inform policymaking and answer the needs of those who want to make decisions use of different dissemination and communication channels for effective dissemination of data visualization products and services.

The project will focus on raising public awareness of official statistics, and data visualization, so that users will perceive them as official statistics, being aware of their quality and compliance with professional standards.

Improving statistical literacy is of key importance for the appropriate use of visualized products and services. The project will cooperate with journalists and data journalists, people in education, and the public; it will attempt to address them via a website that will contain various possibilities for interactive work, e-learning, and using open data.

### Statistical Data Warehouse Outputs:

A statistical data warehouse, also known as a data warehouse (DW), is an electronic storage system that integrates and standardizes vast quantities of data from diverse origins. Its primary objective is to supply business intelligence (BI), reporting, and analytics while also meeting regulatory obligations. By consolidating data into a unified location, data warehouses enable data users to transform raw data into valuable insights and make informed decisions based on data. They serve as a centralized repository for both present and past data, serving as the definitive and authoritative source of information within an organization<sup>23</sup>.



**Figure 2** Generic Analytical Data Architecture<sup>24</sup>

An effectively constructed data warehouse forms the fundamental basis for a thriving business intelligence (BI) or analytics initiative<sup>25</sup>. Its primary function is to support the generation of reports, dashboards, and analytical tools that have become essential in the modern business landscape. By supplying the necessary data, a data warehouse facilitates data-driven decision-making, aiding in making informed choices on a wide range of matters, including new product development and inventory management<sup>26</sup>.

1. Better business analytics
2. Faster queries
3. Smart data communication via data visualization products
4. Improved data quality
5. Historical insight

<sup>23</sup> Tableau (n.d.). Understanding the Value of Data Warehousing & Business Intelligence (BI) [www.tableau.com](http://www.tableau.com)

<sup>24</sup> MODERNIZING DATA GOVERNING: StatsDW AS NATIONAL AGENDA. DOSM. (2022)

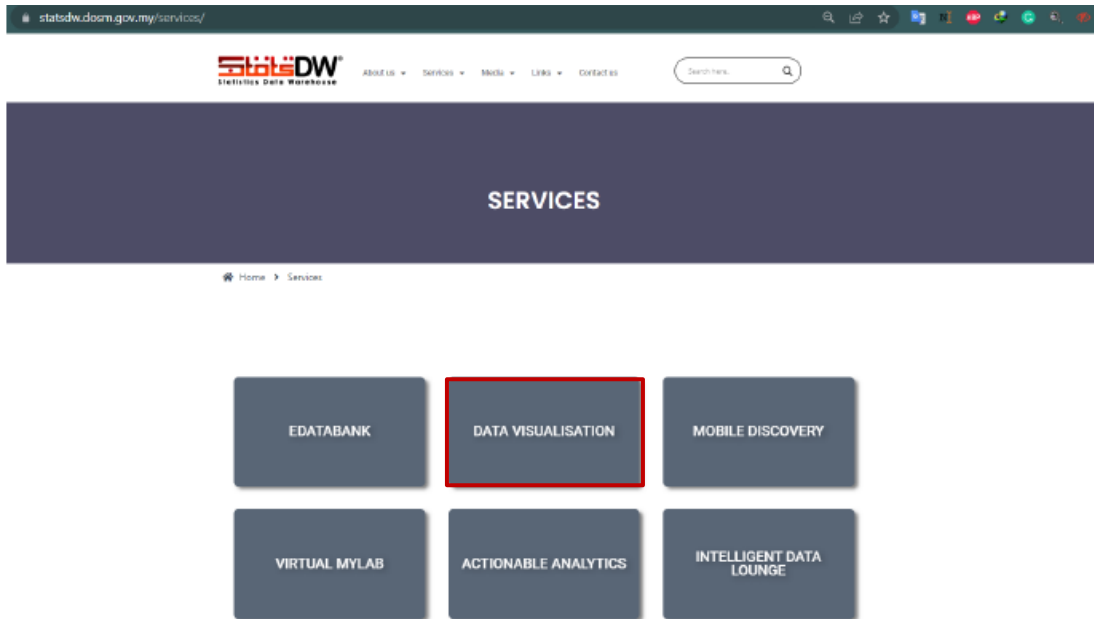
<sup>25</sup> Datapine (2023). How Data Warehousing Can Benefit a Data-Driven Organization [www.datapine.com](http://www.datapine.com)

<sup>26</sup> Symphony (n.d) How Data Warehousing Can Benefit a Data-Driven Organization [symphony-solutions.com](http://symphony-solutions.com)



## Good Practice from Malaysia

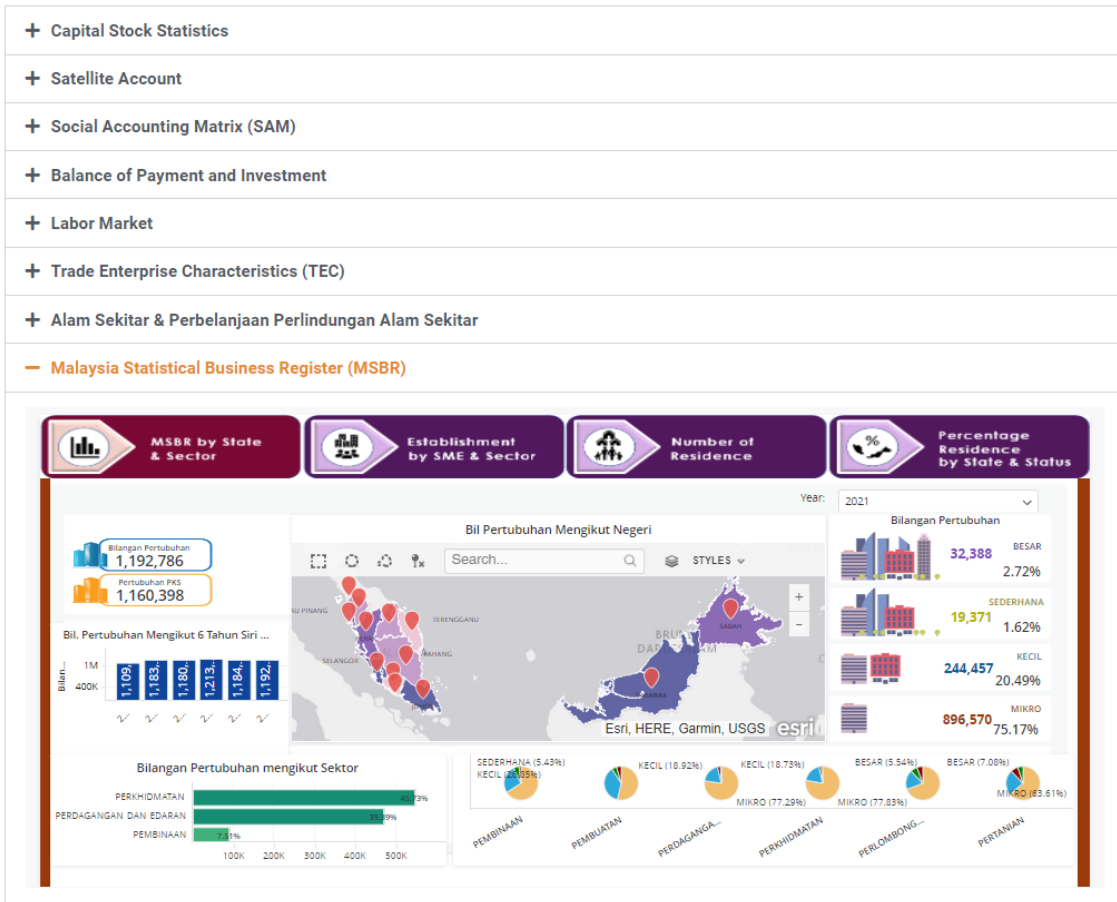
The Department of Statistics Malaysia (DOSM) Statistics Data Warehouse (StatsDW) project aim to provide timely, relevant and integrity information to statistical users by enhancing statistical information communication technology so that data collection, data management and data delivery to all users, be it government, private sector or international organizations, are effectively implemented. (<https://statsdw.dosm.gov.my/services/>)



Department of Statistics Malaysia has traditionally presented its data in many ways: in articles, press releases, tables, databank, maps, bar charts, pie charts, and line graphs. New interactive visualization techniques were first introduced in 2015, with the Industrial Production Index and the Population Pyramid as the best-known examples. These visualizations give a clearer insight into how important data on a specific area interact.



Figure 3 DOSM Example1 on Capital Stock Statistics S-DWH interactive Visualizatio



**Figure 4** DOSM Example 2 on Malaysia Statistical Business Register (MSBR) S-DWH interactive Visualization

All in all, a user-friendly interface or access tools of the S-DWH provide tools that allow users to interact with the data warehouse without requiring extensive technical skills. This can include data visualization tools, ad-hoc query builders, and self-service reporting capabilities. The interface should enable users to explore and analyze the data intuitively and efficiently.



### Summary and call for action

Implementing data visualization in various domains of the above-mentioned framework will enable Planning and Statistics Authority (PSA) and various line ministries and concerned institutions to better harness data for decision-making, measurement, monitoring, and reporting on the progress made in the sustainable development agenda goals 2030 (SDGs) and national development strategies. In addition, the project will strengthen the capacity of the mentioned ministries to develop the capacity of their experts to produce visualized products. As well as the project will benefit from the support and contribution of many national, regional, and international partners

This will help in the production of disaggregated statistics by geographic location combined with data disaggregated by income, sex, age, children, elderly, people with disability, and others to help the production of indicators, which in turn will assist with making decisions informed by visualized data.

While it is already recognized that integration of these forms of data is a critical driver that enables the implementation of the SDGs, this cannot be achieved through statistical tables and indicators alone in part, due to the interconnected and interrelated nature of the SDGs and national development policies.

Data visualization for decision-making will add value to official statistics and will value the data culture.

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16. MODERNIZING DATA GOVERNING: StatsDW AS NATIONAL AGENDA. DOSM. (2022)

### **Target Partners:**

This project can only be realized with strong partnerships with various interested partners.

1. SDGs today
2. Microsoft Corporation
3. United Nations Economic and Social Commission for Western Asia (ESCWA)
4. Qatar Computing Research Institute (QCRI)
5. Statistical, Economic and Social Research and Training Centre for Islamic Countries (SESRIC)
6. Islamic Development Bank Institute (ISDB)
7. Qatar Charity
8. Hamad bin Khalifa University (HBKU)
9. GCC National Statistical Centers (GCC-STAT)
10. United Nations International Children's Emergency Fund (UNICEF)
11. United Nations Development Programme (UNDP)
12. United Nations Educational, Scientific and Cultural Organization (UNESCO) Paris and Doha
13. International Labour Organization (ILO)
14. World Health Organization (WHO)
15. Environmental Systems Research Institute (Esri)
16. UNESCO Institute for Statistics, Montreal
17. Islamic Development Bank (IsDB)